XPWR104HR
High efficiency PC/104 power supply module

User's Manual

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Rev. A

ISO9001 and AS9100 Certified

XPWR104HR
Power supply module
User's Manual

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TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION 6

Features 6

Some of the key features of the XPWR104HR include: 6

Power supply units 6

Connector description 7

What comes with your board 7

Using this manual 7

CHAPTER 2 BOARD INSTALLATION 9

Board installation 9

General installation guidelines: 9

Installation integrated with a PC/104 module stack: 10

Connector descriptions: 12

CHAPTER 3 - HARDWARE DESCRIPTION 13

Remote On/Off control 15

Secondary +12V, -5, and -12V converters for peripherals 15

Overload protection 16

Output power calculations 17

CHAPTER 4 XPWR104HR SPECIFICATIONS 18

Host interface 18

Power supply specifications 18

Connectors 18

Electromechanical 18

CHAPTER 5 RETURN POLICY AND WARRANTY 19

Return Policy 19

CHAPTER 6 LIMITED WARRANTY 21

List of Illustrations

..... Illustrations

Fig. 2-1: XPWR104HR powering an RTD PC/104 cpuModule stack

Fig. 2-2: XPWR104HR power supply power connections

Fig. 3-1: XPWR104HR Block diagram

Chapter 1 INTRODUCTION

This user's manual describes the operation of the XPWR104HR power supply unit for automotive and industrial applications.

Features

Some of the key features of the XPWR104HR include:

- Wide input voltage range 8-32V DC (36V maximum)
- 75W output power guaranteed ***with adequate cooling***, 92% 5V efficiency
- Remote ON/OFF operation
- Power output options include: XPWR104HR +5V, -5V, +12V, -12V
- Two status LED's
- Fully PC/104 compliant
- **Operating temperature -40 to +85 C**
- No electrolytic capacitors to increase the operating altitude

The following paragraphs briefly describe the major features of the XPWR104HR. A more detailed discussion is included in Chapter 3 (Hardware description). The board installation is described in Chapter 2 (Board Installation).

Power supply units

The XPWR104HR power supply unit offers a complete reliable power subsystem for your sophisticated computer and peripherals. To improve reliability in noisy environments, the XPWR104HR is designed using protection devices against over voltages, noise spikes and reverse input voltage. The output current of the +5V converter is limited to 15A. This enables reliable system operation in distributed industrial installations.

The main +5V computer power supply is designed using a high efficiency, dual phase switching regulator module providing high output current (15A) with a high efficiency (92% maximum) under all conditions. The secondary peripheral power supplies are designed using +12V (boost) and -12V (Cuk) converters. Low component count and extensive use of SMD technology ensures low weight and reliable operation. This combination creates low input current ripple to minimize stress on the unregulated input supply. The output creates a very low ripple voltage signature.

The XPWR104HR can be "switched off" from a remote source. If this switch (X1 jumper) is closed the power supply will become inactive while still powered.

Mechanical description

The XPWR104HR is designed on a PC/104 form factor. An easy mechanical interface to both PC/104 and EBX systems can be achieved. Stack your XPWR104HR directly on a PC/104 compliant computer using the onboard mounting holes. Care must be taken to ensure adequate heat dissipation from the onboard heat sink in high output power installations. See the following link for a description of the PC104 specification. http://www.rtd.com/pdf/PC104-246.pdf

Connector description

The power connections are made using "cable plug" type terminal blocks. This enables removing connections from the board without opening the cables from the terminal blocks. The IDAN-XPWR104HR boards always feature screw terminal blocks for inter-frame wiring.

What comes with your board

Your XPWR104HR package contains the following items:

- XPWR104HR board with mating connectors for the power connections
- User's manual

If any item is missing or damaged, please call RTD Embedded Technologies customer service department at the following number: (814)-234-8087.

Using this manual

This manual is intended to help you install your new XPWR104HR module and get it working quickly, while also providing enough detail about the board and it's functions so that you can enjoy maximum use of it's features even in the most demanding applications.

When you need help

This manual will provide you with enough information to fully utilize all the features on this board. If you have any problems installing or using this board, contact our Technical Support Department (814) 234 8087 during American east coast business hours. Alternatively, send a FAX to (814) 234 5218 or Email to sales@rtd.com. When sending a FAX or Email request please include the following information: Your company's name and address, your name, your telephone number, and a brief description of the problem.

Chapter 2 BOARD INSTALLATION

The XPWR104HR power supply module is very easy to connect to your industrial or automotive control system. Direct interface to PC/104 systems as well as EBX size boards is achieved. This chapter tells you step-by-step how to install your XPWR104HR into your system.

Board installation

Keep your board in its antistatic bag until you are ready to install it to your system! When removing it from the bag, hold the board at the edges and do not touch the components or connectors. Please handle the board in an antistatic environment and use a **grounded** workbench for testing and handling of your hardware. Before installing the board in your computer, check the power cabling. Failure to do so may cause the power supply unit to malfunction or even cause permanent damage.

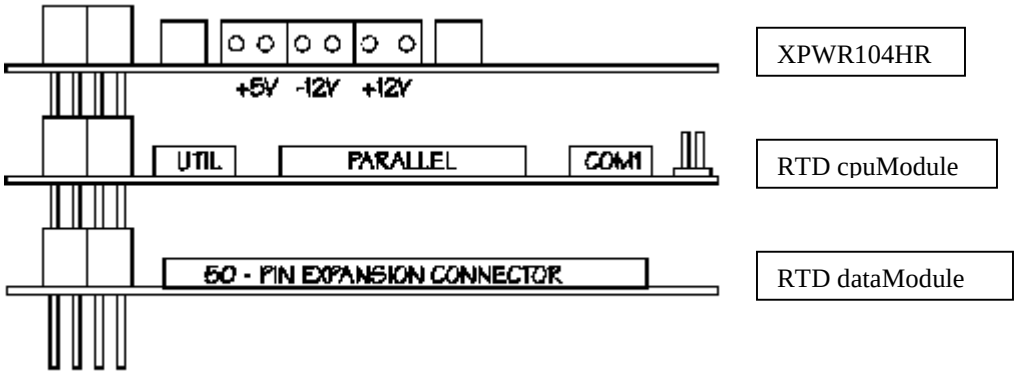
General installation guidelines:

- Touch the grounded metal housing of your computer to discharge any antistatic buildup and then remove the board from its antistatic bag.
- Hold the board by the edges and install it in an enclosure or place it on the table on an antistatic surface.
- Install your board in your system, and wire the power supply correctly.
- Failure to do so may cause the power supply unit to malfunction or even cause permanent damage to the device.
- Make sure to use 16 AWG wire.
- Twist power and ground wires to minimize input inductance
- Keep input wires less than one foot in length
- If you must use longer wires, you may want to attach a large value, high ESR capacitor to the input (i.e. 220uF 50V electrolytic)
- Check all wiring connections once and then once more again.
- Check the input power to the board is in the range of 8 to 32V DC (36V maximum)
- Do not hot plug the input or loads. This causes inductive spikes that can damage the board
- Apply power to your XPWR104HR, and make sure the diagnostic LED's indicate correct operation.

Installation integrated with a PC/104 module stack:

- Secure the four PC/104 installation holes with standoffs.
- Connect the board to the power supply using the power interface connectors.

Fig. 2-1: XPWR104HR powering an RTD PC/104 cpuModule stack



Note:	For full output power performance, install your XPWR104HR at the top of your PC/104 system and make sure adequate cooling is provided. You may increase airflow with the EFAN104 fan module available from Real Time Devices. If used inside an enclosure make sure the internal temperature of the enclosure does not exceed 85°C.

External power connections

The illustration 2-2 below indicates the input and output power connections of the XPWR104HR board mounted in its IDAN enclosure frame. Using IDAN systems the power devices are directly heat sunk to the frame this will give full rated output performance over the complete temperature range of -40 to +85 C.

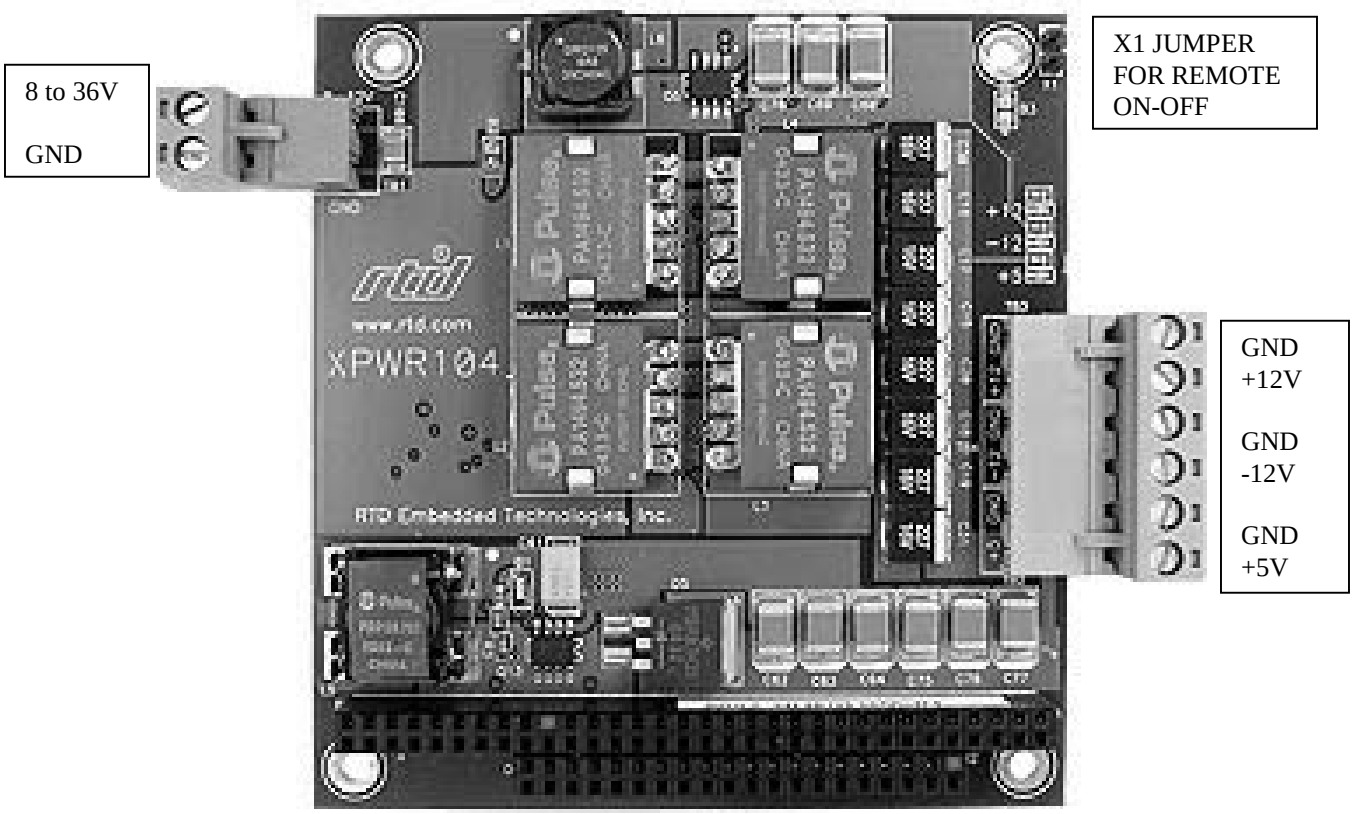


Fig. 2-2 XPWR104HR power supply power connections

Connector descriptions:

Over voltage protected with transient absorber with a working voltage of 36V DC.

Note:	The module input power may be up to 100 W (12.5A), this will require a cable wire diameter of 2 to 3 sq. mm. Make sure this input wire is kept as short as possible to reduce voltage drops and input inductance.

- ***TB1*** Raw input power to the XPWR104HR. Input voltage range is 8-32V DC (36V maximum).
- ***TB2***: +5V Output of the main DC/DC power supply
- ***TB4:*** -12V Output
- ***TB3:*** +12V Output
- ***X1:*** Remote ON/OFF, close this jumper to disable the XPWR104HR

The output voltages are also indicated on the silk-screen on the solder side of the module under the terminal blocks. Check these before making any external power connections. The input of the XPWR104HR is protected against reverse voltages, but will not withstand long term over voltage. The transient absorbers will clip all fast disturbance and noise on the input, but may overheat if a continuous over voltage is present. The transorb is intended to handle transients of 1 millisecond or shorter.

Chapter 3 - HARDWARE DESCRIPTION

This chapter describes the major features of the XPWR104HR, which are the following:

- The main +5V converter for the computer and PC/104 bus
- The secondary power output converters +12V, -5V and -12V for peripheral devices
- Onboard status LED's
- Output power calculations

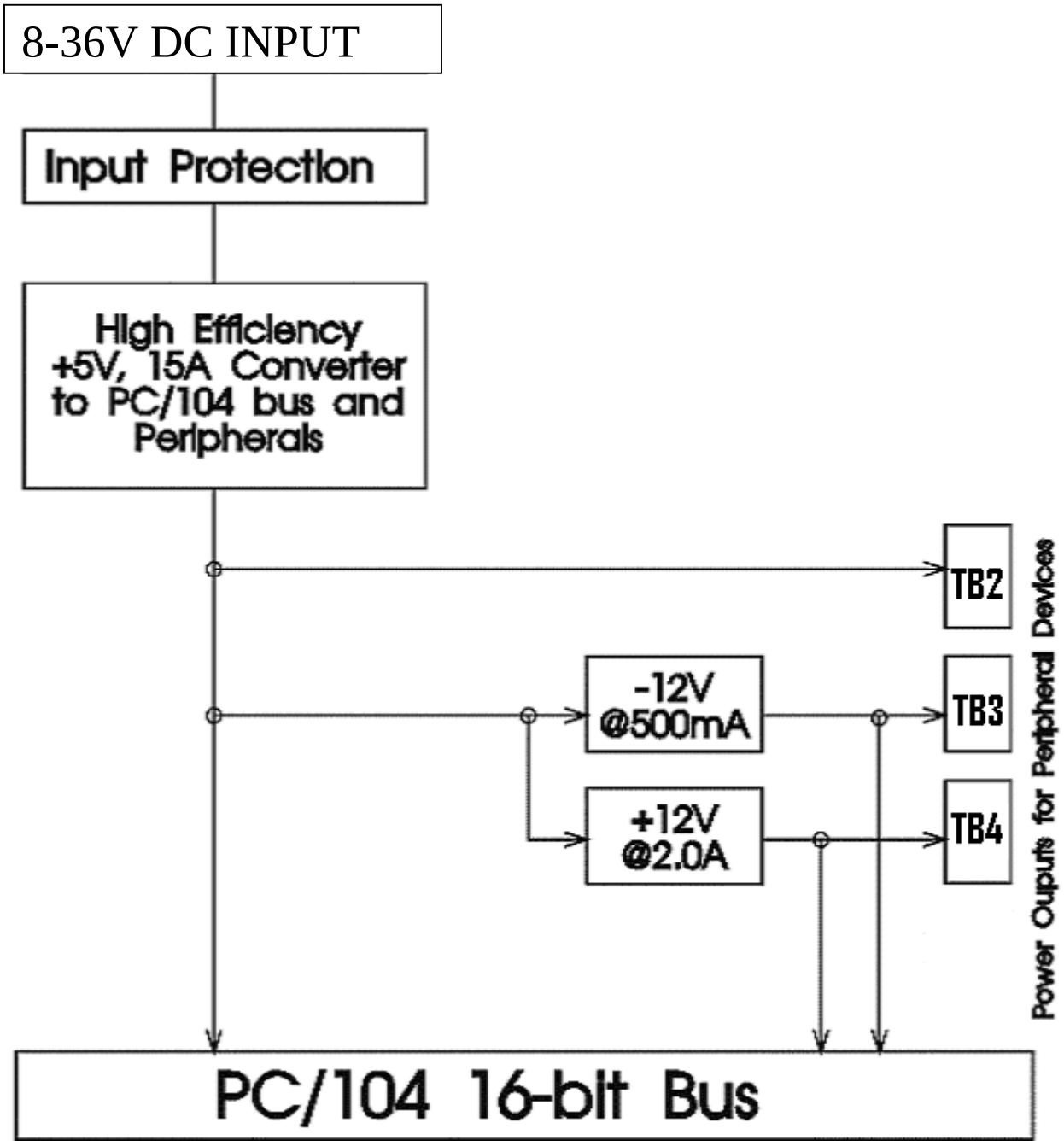


Fig. 3-1 Block diagram of the XPWR104HR

Main +5V converter for computer

The main +5V output is implemented with a synchronous, dual phase switch-mode DC-DC converter design. The output current of this unit is 15A. This converter has excellent dynamic and transient response capabilities making it an ideal high-speed computer power supply.

The input of this converter is protected with a 36V fast transient absorber diode and low loss forward schottky diodes. These devices are necessary to protect the input in automotive and industrial installations against fast over voltage spikes and reverse voltage connections. This converter is equipped with a current foldback circuit to protect it from short-circuit or overload conditions.

The main +5V converter feeds the PC/104 AT bus +5V pins with power. This power can also be taken from the board from an external terminal block TB2. (See previous section for the location of terminal block TB2.). Additionally this supply is cascaded into the +12V and the –12V circuits.

Remote On/Off control

Header connector X1 near one of the PC/104 mounting holes is the remote ON/OFF selection switch. Closing this connection will disable the XPWR104HR and place the converter “OFF”. In this condition the XPWR104HR will consume minimum power. This signal could be connected to the ignition key of an automobile or machine.

Secondary +12V, -5, and -12V converters for peripherals

A 5V to +-12V converters with 88%(12V) and 77%(-12V) efficiency generates +-12V for peripheral devices such as EL- or TFT- panels, hard drives, motors etc. The +12V output delivers 2.0A of current. +12V power is available from terminal block TB3. The -12V power is available from terminal block TB4. (See previous section for location of terminal blocks.) . The +12V and -12V supplies also power the PC/104 bus.

The +12V converter is a boost converter. Because of this architecture any sustained short on the +12V will be seen as a short on the 5V converter and the 5V converter will go into current foldback to effectively protect the 12V converter. Additionally this converter is immune to input line fluctuations because it is cascaded from the 5V converter.

The –12V converter is a Cuk topology and is known for having continuous input and output current for an exceptionally clean output voltage. This converter is also cascaded from the 5 Volts and is current limited so if a short occurs the output voltage just decays similar to a current foldback.

The –5V converter is a linear supply that is cascaded from the –12V converter. This converter is limited to 100 milliamps and is 38% efficient.

Onboard status LED's

The XPWR104HR is equipped with 2 indicator LED's. The function of the LED's is described below. These LEDs are near the power connectors and are in the order of the output and are labeled.

- LED1 - Green. Indicates +5V power converter is alive
- LED2 - Green. Indicates +12V converter is alive
- LED3 - Green. Indicates -12V converter is alive

Overload protection

The +5V converter can regulate to greater than 18 amps. The current limit is higher that the maximum continuous output current to ensure reliable operation near the maximum rated output power. Fast current surges are allowed over the rated 15A continuous current.

The +12V converter is rated to 2A and the -12V converter is rated for 500mA.

Output power calculations

The maximum available power for the +5V computer system can be estimated using the following conservative formula:

(The output of the main converter is 15A)

I1 = (+12V output current)
I2 = (-12V output current)
I3 = (+5V output current)
I4 = (-5V output current)
I_bus = +5V to bus
75W = ((I1*12)/0.88 + (I2*12)/0.77 +((I4 *5)/0.038)/0.77)/0.92 + I_bus*5+I3*5

Note: Even though the total output power figure of 15A @5V is not exceeded you must remember not to overload an individual output! Care must be taken not to thermally overload the unit. The maximum specified output power may not be available if the ambient temperature rises, and in this case additional heat sinking or additional airflow may be necessary.

Chapter 4 XPWR104HR SPECIFICATIONS

Host interface

16-bit data bus with power pins +5V, +-12V connected to power outputs

Power supply specifications

Input voltage range guaranteed	8-32V DC (36V maximum)
Output Power (75W total)	+5V@15A @ 92% +12V@2.0A @ 88% -12V @ 500mA @ 77%
Fully loaded board Efficiency	85.8%
Output load regulation (including transient load)	5% maximum
5 Volt maximum power dissipation	6.52 Watts
-12 Volt maximum power dissipation	1.79 Watts
+12 Volt maximum power dissipation	3.27 Watts
-5 Volt maximum power dissipation	0.82 Watts
Maximum overall power dissipation	12.4 Watts

Connectors

Power connectors	Phoenix Contact Combicon Series
Host bus	AT PC/104 bus

Electromechanical

Operating temperature range	-40 to +85 C
Heat sink temperature (Max)	+85 C
Internal power dissipation	12.4W (Max)

Chapter 5 RETURN POLICY AND WARRANTY

Return Policy

If you wish to return a product to the factory for service, please follow this procedure:

Read the Limited Warranty to familiarize yourself with our warranty policy.

Contact the factory for a Return Merchandise Authorization (RMA) number.

Please have the following available:

- Complete board name
- Board serial number
- A detailed description of the board's behavior

List the name of a contact person, familiar with technical details of the problem or situation, **along with their phone and fax numbers, address, and e-mail address** (if available).

List your shipping address!!

Indicate the shipping method you would like used to return the product to you.
We will not ship by next-day service without your pre-approval.

Carefully package the product, using proper anti-static packaging.

Write the RMA number in large (1") letters on the outside of the package.

Return the package to:

RTD Embedded Technologies, Inc.
103 Innovation Blvd.
State College PA 16803-0906
USA

Chapter 6 LIMITED WARRANTY

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, INC. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for an RMA number.

THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCTS WHICH HAVE BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, "acts of God" or other contingencies beyond the control of RTD Embedded Technologies), OR AS A RESULT OF SERVICE OR MODIFICATION BY ANYONE OTHER THAN RTD Embedded Technologies. EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND RTD Embedded Technologies EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED HEREIN. ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES FOR MECHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THIS WARRANTY. IN THE EVENT THE PRODUCT IS NOT FREE FROM DEFECTS AS WARRANTED ABOVE, THE PURCHASER'S SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED ABOVE. UNDER NO CIRCUMSTANCES WILL RTD Embedded Technologies BE LIABLE TO THE PURCHASER OR ANY USER FOR ANY DAMAGES, INCLUDING ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOST PROFITS, LOST SAVINGS, OR OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT.

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